

APPENDIX 1

NETWORK DESIGN AND ESB TELECOMS LTD

1.0 INTRODUCTION

In the seventy years that followed Alexander Graham Bell's invention of the telephone half a billion fixed telephone lines were installed world-wide. Impressive as that statistic is it is dwarfed by the uptake of mobile phone technology, of one billion in use within ten years of its introduction and around two billion at present.

Ten years ago there were fewer than 400,000 mobile phones in use in Ireland, today the number of mobile phones in use stands over 5 million.

1.1 BACKGROUND TO MOBILE TECHNOLOGY

GSM mobile networks are also known as 2G or Second Generation networks. GSM is known as 2G because it was designed as a replacement for the earlier first generation analogue networks (for example the 088 network). The roll out of GSM in Ireland began around 1995 and a network was built by Vodafone, O2 and Meteor. GSM was primarily designed to carry voice calls with some very low speed data application such as fax transmission.

In recent years some developments were made to GSM to allow slightly faster data transmission. This is known as 2.5G and was a stepping stone to the launch of 3G networks. An example of an application enabled by 2.5G is picture messaging, which the new camera phones use.

The Universal Mobile Telephone System (UMTS) is also known as 3G. 3G is a broadband development of wireless networks. Its purpose is to allow a high speed connection between the network and a subscriber who is on the move. In addition to voice calls, some of the services that can be provided for over a 3G network include:

- Video calling- where the people communicating can see each other
- High speed internet access
- Video Messaging
- Streamed video and audio clips
- Location based services

3G technology was replaced over the course of 2013/14 with 4G technology, which allowed speeds fast enough to allow full internet connectivity on smartphones. At this point mobile networks are looking to upgrade their technology once more to allow for faster connection speeds and uploading speeds.

1.2 DIFFERENCE IN NETWORK DESIGN

3G and 4G networks are intended to provide different services, as a result of this, the constraints when placing the base stations are different. The main differences are described below.

The frequency used by the UTM system is 2100MHz. The two frequencies used by the GSM system are 1800 MHz and 900MHz. The higher the frequency of a radio system the shorter the distance it will propagate. As a rule of thumb an 1800MHz signal will only propagate half the distance of a 900MHz signal.

Cell sizes are also determined by the surrounding terrain and surrounding obstructions – for example the size of nearby buildings that might come between the subscriber and the cell site. Approximate typical cell radii for 4G networks would be:

- 150m to 250m for cells in urban areas
- 700m to 1000m for cells in suburban areas
- 2km to 5km for cells located in rural areas

As the radio frequencies of mobile cells increase to allow for increase download and upload speeds, the cell sizes tend to decrease in size, requiring additional sites. Furthermore, cells will shrink in size during busy periods when there are a lot of users on the system as the base stations can manage a limited amount of data at a given point in time. Allowance must be made for this so that coverage gaps do not appear during these busy times.

ESB Telecoms Limited

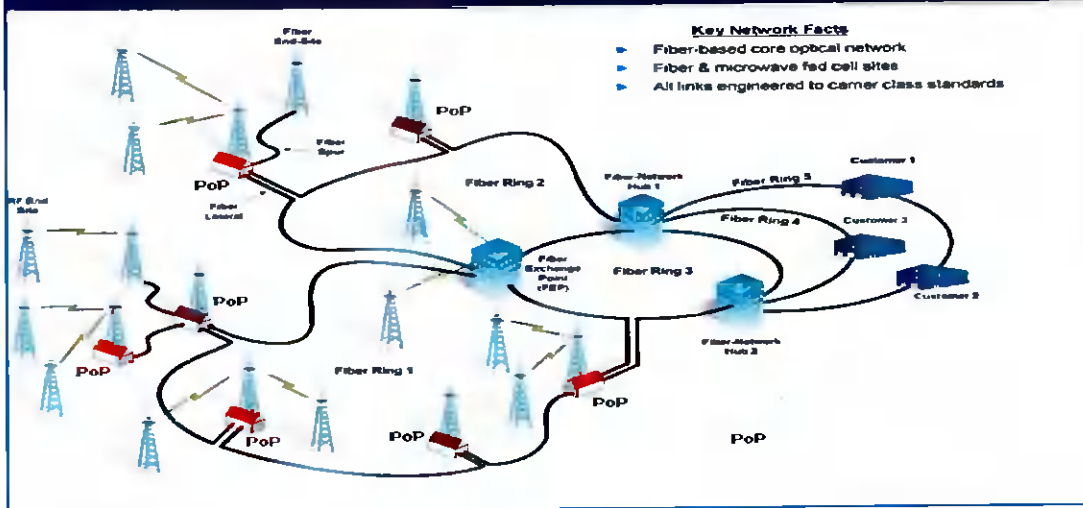
ESB Telecoms Ltd was established in early 2001 as a subsidiary company to ESB, Ireland's premier electricity supplier. Since that time ESB Telecoms has been a leading independent telecommunications infrastructure provider, delivering high quality, turnkey communication network solutions to all potential co-location customers at market rates.

ESB Telecoms Ltd now provides network solutions for a wide variety of network operators, wireless broadband providers, as well as transferring data for the ESB Supervisory Control and Data Acquisition (SCADA) system. In recent years we have grown a substantial external customer base, supporting a wide range of private and public sector business activities. ESB Telecoms built and owns a 1,300 kilometre National Fibre Optic Network (NTFON). The NTFON is constructed in a 'Figure of Eight' around Ireland and also includes a spur from Carrick-on-Shannon to Buncrana, now connected back to Dublin via BT (NI). The NTFON is used to provide fibre connections to ESB Telecoms tower portfolio, which in turn supports high capacity bandwidth connections to our radio tower customers. Our customers, who are the major mobile operators such as H3G, Vodafone and Eir, along with smaller broadband operators such as Imagine require these high bandwidth connections to provide services such as internet access/voice and data services. Thus, enabling high speed data connections to urban and remote locations that may otherwise have been overlooked.

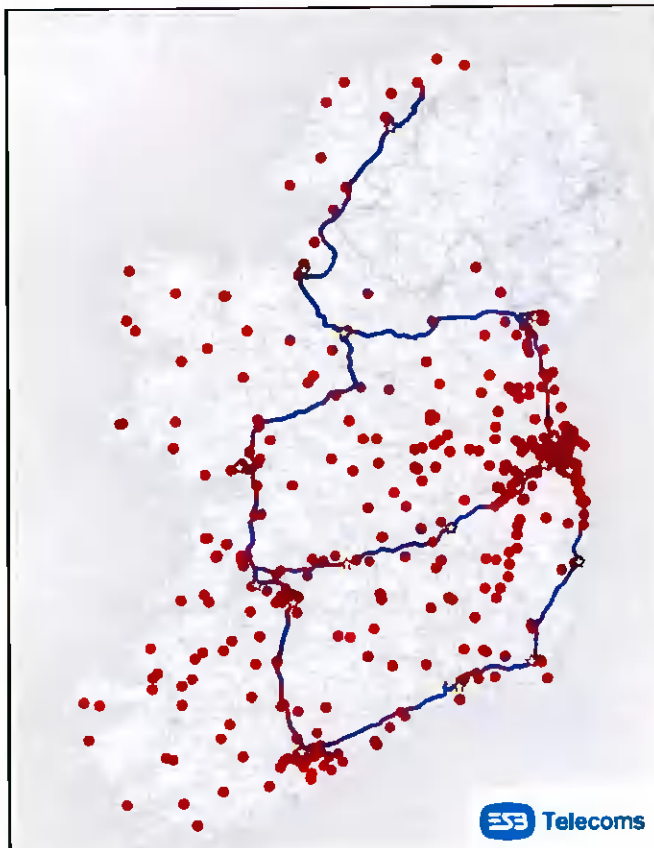
It is ESB Telecoms Ltd policy to design and construct our communication structures to the highest international standards. All sites developed by ESB Telecoms are made available to our customer base as points for co-location. Customers provide mobile broadband and wireless broadband coverage from these ESBT sites, using existing networks and future telegraphy technologies.

The diagram below illustrates the concept – fibre is used to connect to towers close to the fibre network, the towers also support microwave radio links to other sites.

FiberTower Backhaul Network Architecture



The extent of NTFON is illustrated on the diagram below with the route of the NTFON shown as a 'blue' line. The 'red dots' are towers. The proposed development would potentially enable mobile and broadband customers in the Clondalkin area to avail of the existing fibre network that currently broadly runs along overhead wires along the route of the Cand Canal to the north of the site, providing the opportunity to deliver an attractive bandwidth and high speed broadband penetration into the area to the benefit of the local community and businesses.



ESB Telecoms National Fibre Optic Network

3. HOW THE SITE WILL FITS INTO ESB TELECOMS LIMITED PORTFOLIO OF SITES

ESB Telecoms are a provider of telecommunications infrastructure to all market players in the telecommunications industry. We seek to build telecoms infrastructure where and when it is required by responding to market demand. In this instant application, ESBT would like to continue to operate from its compound within the ESB Clondalkin 38kV Substation by replacing the existing 25m high telecommunications lattice structure with a new 20m monopole capable of serving two mobile and broadband operators from this site. The Eir and Vodaphone. The need for the site will be explained further in the Planning Statement while **Appendix 3** of the Statement provides a technical justification for the site including existing coverage plots from the existing 25m high lattice, the change in coverage that would be achieved from the 20m high monopole and the loss of coverage and services to the residents, businesses and visitors to Clondalkin if the site itself were to be refused planning permission and was decommissioned.